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Effect of behavioral stage-based nutrition education on management of osteodystrophy among hemodialysis patients, Lebanon

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ABSTRACT

Objective: Assess the effect of intensive nutrition education by trained dedicated dietitians on osteodystrophy management among hemodialysis patients.
Methods: Randomized controlled trial in 12 hospital-based hemodialysis units equally distributed over clusters 1 and 2. Cluster 1 patients were either assigned to usual care ($n=96$) or to individualized intensive staged-based nutrition education by a dedicated renal dietitian ($n=88$). Cluster 2 patients ($n=210$) received nutrition education from general hospital dietitians, educating their patients at their spare time from hospital duties. Main outcomes were: (1) dietary knowledge(%), (2) behavioral change, (3) serum phosphorus (mmol/L), each measured at T0 (baseline), T1 (post 6 month intervention) and T2 (post 6 month follow up).
Results: Significant improvement was found only among patients receiving intensive education from a dedicated dietitian at T1; the change regressed at T2 without statistical significance: knowledge (T0: 40.3; T1: 64; T2: 63) and serum phosphorus (T0: 1.79; T1: 1.65; T2: 1.70); behavioral stages changed significantly throughout the study (T0: Preparation, T1: Action, T2: Preparation).
Conclusion: The intensive protocol showed to be the most effective.
Practice implications: Integrating dedicated dietitians and stage-based education in hemodialysis units may improve the nutritional management of patients in Lebanon and countries with similar health care systems.

1. Introduction

Lack of adherence to dietary restrictions among hemodialysis (HD) patients is common [1]; and globally, the prevalence of HD patients is on the rise [2]. These patients often suffer from elevated serum phosphorus (P); a leading cause of chronic kidney disease–mineral bone disorder (CKD–MBD) and mortality [3]. The management of this condition includes HD, dietary P restriction to 800–1000 mg/day, P density (P/protein) limited to 10–12 mg/g/day and P-binders [4,5]. Consequently, adherence to *P*-restricted diet is the most difficult for HD patients [6].

Strong evidence support the use of behavioral change models to facilitate dietary lifestyle changes [7]. The transtheoretical model (TTM) or the stages of behavioral change model (referred to, in this article, as TTM stage) assesses the readiness to change in behavior among individuals. Behavioral change is a dynamic process whereby people move from one stage to another over time. TTM includes 5 stages: (1) pre-contemplation, (2) contemplation, (3) preparation, (4) action and (5) maintenance. To stimulate transitions, an appropriate stage-based intervention needs to be planned [8]. Recent literature illustrates the effectiveness of stage-matched nutrition education (NE) [9,10], demonstrating its superiority over non-stage-matched ones [11].

A recent review [12] on effective dietary counseling interventions for hyperphosphatemia management in HD patients identified the following key tools to enhance behavioral change: (1) multidisciplinary approach coupled with a decisional partnership with the patient, (2) behavioral theory-based individualized education with frequent reinforcement, (3) easy-to-comprehend educational material targeting simple skills using booklets, live demonstrations, posters and recipes adapted to cultural preferences.

In Lebanon, HD units are exclusively hospital-based and hospital dietitians are responsible for NE among other duties.

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Moreover, these dietitians are overloaded and do not have the optimal competencies needed to manage HD patients [13].

The current study primarily aimed to assess the effect of trained dedicated dietitians on HD patient clinical outcomes compared with partially dedicated dietitians with or without specialized training on hyperphosphatemia management. The secondary aim was to study the effectiveness of an intensive, individualized, stage-based psycho-educational nutrition intervention focused on P compared with the non-stage-based model used in routine care.

2. Methods

2.1. Design

The protocol, data collection instruments, hospital and patient selection criteria, randomization method and group baseline characteristics have been published elsewhere [14]. For the scope of this article, we will summarize the methodology and provide additional details on the development of patient and dietitian education materials and on data analysis addressing the aim of this study.

In brief, the nutrition education for management of osteodystrophy (NEMO) is a randomized controlled trial in 12 hospital-based HD units, equally and randomly allocated to clusters 1 and 2. Half of the patients in cluster 1 were randomly chosen according to their dialysis shift and assigned to the intensive protocol (dietitian dedicated—DD), and the other half served as control (existing practice—EP). All patients in HD units recruited to cluster 2 were assigned to the partial intervention protocol (trained hospital dietitian—THD). Sample size was calculated based on a previous publication [15] to detect significant changes in the primary outcome (serum P). Accordingly, a minimum sample of 50 participants was identified for each study group. We doubled this number for the THD group to account for the expected drop in the effect size. Moreover, the sample size for all groups was multiplied by 3 to account for the 3 different sizes of the HD units [14] and 20% were added to compensate for refusals, loss to follow up, and drop-outs. DD patients received individualized twice weekly staged-based NE for 6 months by trained study dietitians. As for the EP group, hospital dietitians who were blinded to study, provided usual care. THD patients received NE by the trained hospital dietitian, whenever the latter had spare time from their overloaded schedule of other hospital duties. DD and THD dietitians were trained by the study's principal investigator (PI) on renal dietetics.

The trial was conducted according to the guidelines of the Declaration of Helsinki and all procedures involving human subjects were approved by the institutional review board of each participating institution. Patients were provided with consent forms that explained the study procedure and timelines, pros and cons and permission to review patients' files. Only consenting patients were included to the study. Confidentiality and anonymity of participants were maintained by the use of coding.

2.2. Patient education material and protocol

Semi-structured qualitative interviews were conducted with a focus group of 15HD patients and 3 dietitians working with renal patients in Lebanon. Our aim was to explore their perspectives on facilitators and barriers toward optimal adherence to P-restricted diet. Patients' and dietitians' answers are detailed in Tables 1 and 2, respectively. According to the focus group results and the principles of the TTM stages, patient educational material was developed. Moreover, the structure of the lessons was adapted from Fickenor and Byrd-Bredbenner [16], after the approval of the main author; although the latter addressed a different topic in chronically ill population. For practicality and following Fickenor and Byrd-Bredbenner [16], the 5 TTM stages were grouped in 3 categories and accordingly, the educational material was prepared: (1) pre-action (pre-contemplation, contemplation, and preparation), (2) action and (3) maintenance. In each stage, several topics were discussed and repeated among stages (Table 3).

At the end of the study, all participants received a folder that included the used material. The educational materials were printed in low literacy level, in bold and in illustrative photos. The Arabic language was used for all printed material. Fifth grade level sentences were employed to facilitate comprehension as recommended by Aldridge [17]. Along with the lessons, 4 other educational tools were used: (1) a renal recipe book tailored to the Lebanese cuisine, (2) an illustrated booklet of low P food options, (3) a poster of low P foods hung in the unit's waiting room and (4) an in-center patient adherence contest to serum P. Evidence support the effectiveness of these types of the educational tools in improving patient dietary adherence [18].

Throughout the intervention, these educational materials were integrated in an individualized education protocol by the research dietitians, only to the patients of the DD group.

All patients were assessed for TTM stage at baseline, but irrelevant of their stage, they were first educated with the pre-action material. This was done for the fact that there are no full time dietitians in Lebanese HD units, leading us to believe that none of the patients had received a formal and complete dietary counseling. After which educational material was provided according to the readiness change of the patient. NE was given twice per week for 15 min during 6 months, amounting to a total of 12 h of education per patient. The intervention duration was in accordance with the 2-h per month of dietitian-to-renal patient time recommendation by the Academy of Nutrition and Dietetics (ADA-EAL) [19] and the minimum duration needed for behavioral change to take place (6 months) as suggested by Sneed and Paul [20]. During the 1st weekly session, the theme of the week was explained. In the 2nd weekly session, the patient was asked to recall the lesson of the previous session, to guarantee comprehension; whether the patient did or did not recall, the lesson was explained again, but this time with individualized feedback. Finally, at the beginning of each month, new monthly blood tests

Table 1
Patient focus group results ($n = 15$).

% of patient	Opinion
100	The need for more self-management skills and alternatives to forbidden foods, to have more freedom in choosing food items on a daily basis
100	Eating in group (with family or friends) makes it more difficult to comply with the restricted diet, when the others are eating forbidden foods
90	If the dietitian visited the HD unit daily, for sure I would comply more
50	Advice from health care professionals is not very realistic
40	Family bring forbidden foods to home, and make it available at all times. This makes it difficult to adhere to a restricted diet
20	Inability to buy or prepare foods for the uremic diet
13	Adherence becomes easier when symptoms appear
13	Bored of restrictions, want to live like everyone
7	Depression leading to indifference. No matter what I do, I will still be on HD, so why to comply?

HD, hemodialysis.